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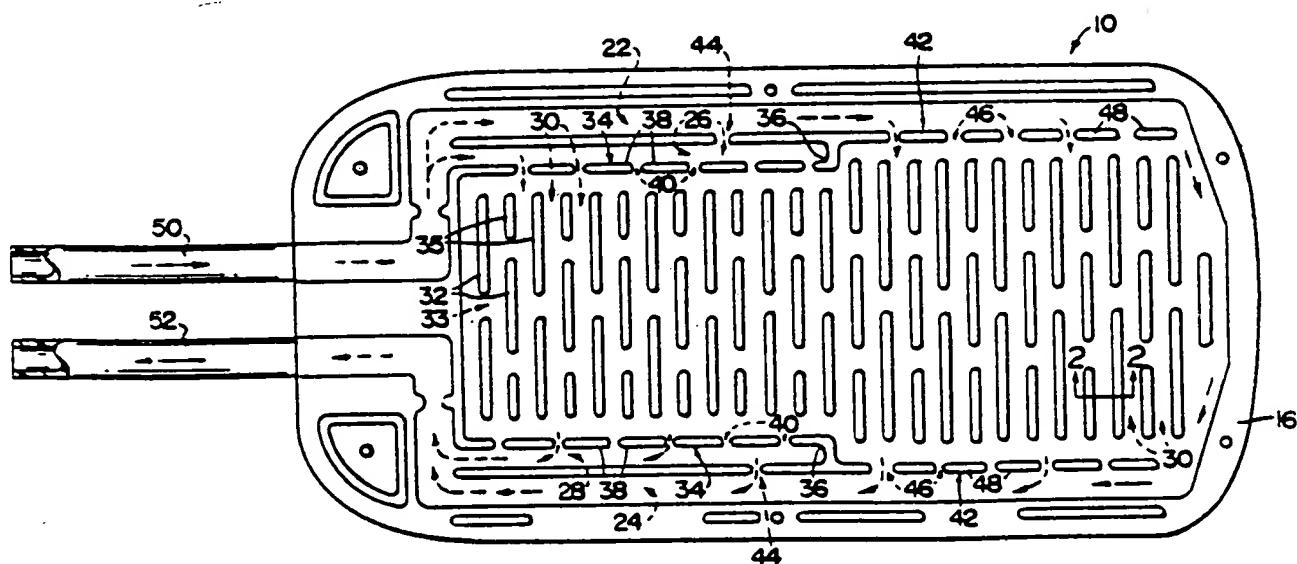
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(54) Title: MULTI-LAYER DISPOSABLE MEDICAL THERMAL BLANKET



## (57) Abstract

A multi-layer disposable medical thermal blanket (10) for controlling body temperature by either heating or cooling at selected areas of application comprising an inner bladder (12) forming a matrix conduit for circulating fluid therethrough having a highly absorbent fabric layer (14) formed on one surface thereof to provide enhancement thermo-conduction and a moisture proof layer (16) formed on the opposite surface thereof to inhibit condensation thereon, the matrix conduit comprising an outer primary fluid path (22/24) disposed about the outer periphery of the thermal blanket and an inner secondary fluid path (26/28), the outer primary fluid path (22/24) being enlarged relative to the inner secondary fluid path (26/28) to form a barrier with the applied area of the patient's body to retain the thermal energy to the applied area and form a moisture barrier therebetween and a plurality of thermal-application channels (30) disposed substantially perpendicular to the outer primary (22/24) and inner secondary (26/28) fluid paths for application to the patient's body.

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## MULTI-LAYER DISPOSABLE MEDICAL THERMAL BLANKET

### Background of the Invention

A multi-layer disposable medical thermal blanket for heating or cooling selected areas of a patient's body.

Numerous devices have been developed to provide a temperature controlled pad or blanket to be applied to a selected area of a patient's body. In designing such a thermal blanket or pad it is important to prevent or minimize the accumulation of moisture, enhance the retention of thermal energy to the selected area of application and avoid pinching off the fluid conduits and thus the fluid should the thermal blanket or pad become folded.

Often such thermal pads comprise a pliable vinyl, having a continuous, serpentine conduit formed therein to circulate a heated or cooled liquid therethrough.

Other examples of such thermal blankets disclose highly absorbent covering which act as a temperature control applicator.

Examples representative of the prior art are found in U. S. 2,110,022; U. S. 2,726,658; U. S. 3,463,161; U. S. 3,867,939; U. S. 3,871,376; U. S. 3,871,381; U. S. 4,114,620; and U. S. 4,149,541.

### Summary of the Invention

The present invention relates to a multi-layer disposable medical thermal blanket for controlling body

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temperature by either heating or cooling a select area of application on patient's body. As described more fully hererinafter, the thermal blanket comprises an inner bladder having a highly moisture absorbent fiber layer and a moisture-proof layer disposed on opposite sides thereof.

The inner bladder comprises a pair of bladder elements sealed together to form a plurality of fluid conduits therebetween, including an outer primary and inner secondary fluid path and a matrix of thermal application channels. More specifically, the outer primary fluid path comprises an outer primary fluid supply and return path in fluid exchanging relationship relative to each other disposed about the outer periphery of the thermal blanket. The inner secondary fluid path comprises an inner secondary fluid supply and return path in fluid exchanging relationship relative to each other disposed inwardly relative to the outer primary fluid path. The outer primary fluid supply and return extend substantially the length of the thermal blanket while the inner secondary fluid supply and return path extend substantially one-half the length of the thermal blanket.

Extending substantially perpendicular to the outer primary and inner secondary fluid paths is a matrix of thermal application channels to circulate fluid therethrough between the supply and return paths.

The highly appropriate fabric layer is used for the heating application and may be moistened to further enhance the thermal conductivity through the inner bladder to the patient's body. The moist-proof layer is used for cooling application.

In operation, the thermal blanket is coupled to a fluid heating and cooling circulating source. As the fluid is circulated into the thermal blanket, it simultaneously enters the outer primary fluid supply

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path and inner secondary fluid supply path and is forced longitudinally down the thermal blanket. The fluid then enters the inner portion of the matrix of thermal channels. As fluid passes through the matrix of thermal application channels, it is fed into the inner secondary return path and outer primary fluid return path and returned to the circulating source.

5                 The invention accordingly comprises the features of construction, combination of elements, and arrangement  
10                 of parts that will be exemplified in the construction hereinafter set forth, and the scope of the invention will be indicated in the claims.

Brief Description of the Drawings

15                 For a fuller understanding of the nature and objects of the invention, reference should be had to the following detailed description taken in connection with the accompanying drawings in which:

FIG 1 is a top view of the multi-layer disposable medical thermal blanket.

20                 FIG 2 is a cross-sectional end view of the multi-layer disposable medical thermal blanket taken along line 2-2 or FIG 1.

Similar reference characters refer to similar parts throughout the several views of the drawings.

25                 Detailed Description

As shown in FIGS 1 and 2, the present invention relates to a multi-layer disposable medical thermal blanket generally indicated as 10 for controlling body temperature by either heating or cooling a select area of application on the patient's body. As described more fully hereinafter, the thermal blanket 10 comprises an inner bladder having a highly moisture absorbent fiber layer and a moisture-proof layer disposed on opposite sides thereof generally indicated as 12, 14, and 16 respectively.

application channels 30 are supplemented by fluid passing through the supplemental fluid path channel 44 formed in the interrupted rib 42. Fluid is supplied to the outer portion of the thermal blanket 10 through the plurality of primary fluid path channels 46 forming the outer portion of the interrupted rib 42. Since the outer portion of the interrupted ribs 32 are disposed inwardly of the interrupted ribs 34 and 42 in combination with the cross channels 33, fluid is permitted to freely balance the pressure within the entire matrix of thermal application channels 30. As fluid passes through the matrix of thermal application channels 30, it is permitted to exit through channels 40, 44, and 46 into the inner secondary return path and outer primary fluid return path 28 and 24 respectively. Stops 36 are formed on the mid portion of the interrupted ribs 42 to limit flow between the inner secondary fluid path 28 and the outer portion of the thermal blanket 10. The unique matrix of conduits prevents pinching off of the entire thermal blanket 10 even through the thermal blanket 10 may be folded.

It will thus be seen that the objects set forth above, and those made apparent from the preceding description are efficiently attained and since certain changes may be made in the above construction without departing from the scope of the invention, it is intended that all matter contained in the above description or shown in the accompanying drawings shall be interpreted as illustrative and not in a limiting sense.

It is also to be understood that the following claims are intended to cover all of the generic and specific features of the invention herein described, and all statements of the scope of the invention which as a matter of language, might be said to fall therebetween.

Now that the invention has been described,

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Extending substantially perpendicular to the outer primary and inner secondary fluid paths is a matrix of thermal application channels each indicated as 30. In forming the outer primary and inner secondary fluid paths and thermal application channels 30 a plurality of ribs separating the various fluid paths and channels are formed. More specifically, the thermal applicatin channels 30 have interrupted ribs 32 on opposite sides thereof forming cross channels 33 thus permitting communication between adjacent thermal application channels 30 to more evenly distribute the pressure over the entire thermal blanket 10. The inner secondary fluid path includes an interrupted rib and stops 34 and 36 respectively. Adjacent segments 38 of the interrupted ribs 34 cooperatively form secondary fluid path channels each indicated as 40. The outer primary fluid path includes an interrupted rib 42 having supplemental fluid channel 44 in communication with the secondary fluid path and a plurality of primary fluid path channels each indicated as 46 on the outer portions thereof formed by adjacent segments 48.

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The highly absorbent fabric layer 14 is used for the heating application and may be moistened to further enhance the thermal conductivity through the inner bladder 12 to the patient's body.

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In operation, the thermal blanket 10 is coupled to a fluid heating and cooling circulating source by inlet supply conduit and outlet supply conduit 50 and 52 respectively. As the fluid is circulated into the thermal blanket 10 through inlet supply conduit 50, it simultaneously enters the outer primary fluid supply path 22 and inner secondary fluid supply path 26 and is forced longitudinally through the thermal blanket 10. The fluid enters the inner portion of the matrix of thermal channels 30 through the secondary fluid path channels 40. The inner portion of the matrix of thermal

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The inner bladder 12 comprises a pair of bladder elements 18 and 20 sealed together to form a plurality of fluid conduits therebetween. The fluid conduits comprise an outer primary and inner secondary fluid path and a matrix of thermal application channels. More specifically, the outer primary fluid path comprises an outer primary fluid supply path 22 and an outer primary fluid return path 24 in fluid exchanging relationship relative to each other disposed about the outer periphery of the thermal blanket 10. The inner secondary fluid path comprises an inner secondary fluid supply path 26 and an inner secondary fluid return path 28 in fluid exchanging relationship relative to each other disposed inwardly relative to the outer primary fluid path. The outer primary fluid supply path 22 and outer primary fluid return path 24 extend substantially the length of the thermal blanket 10 while the inner secondary fluid supply path 26 and inner secondary fluid return path 28 extend substantially one half the length of the thermal blanket. The cross sectional area of the primary fluid path is substantially greater than the secondary fluid path and thermal application channels to permit the primary fluid path to expand outwardly from the surface of the thermal blanket 10 under the fluid pressure as the fluid is circulated through the thermal blanket 10 to effectively form a seal with the patient's body at the selected area of application to retain the thermal energy to the applied area when in the cooling mode with the moisture-proof layer adjacent the patient's body. As a result of the moisture inhibiting nature of the moisture proof layer 16, no condensation is formed on the surface of the moisture proof layer 16 thereby reducing the presence of undesired moisture or fluid. Layer 16 comprises a flexible sheet of closed cell foam formed by a plurality of discontinuous voids.

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CLAIMS

35 1. A multi-layer disposable medical thermal  
blanket for controlling body temperature by either  
heating or cooling selected areas of application  
5 comprising an inner bladder forming a matrix conduit for  
circulating fluid therethrough, said matrix conduit  
comprising an outer primary fluid path disposed about  
the outer periphery of the thermal blanket and an inner  
10 secondary fluid path, and a plurality of substantially  
parallel thermal-application channels inclined relative  
to substantially outer primary and inner secondary fluid  
paths to provide fluid communications therebetween for  
application to the patient's body.

15 2. The multi-layer disposable medical thermal  
blanket of Claim 1 wherein said outer primary fluid path  
comprises a primary fluid supply path and primary fluid  
return path in fluid exchanging relationship relative to  
each other disposed about the outer periphery of said  
thermal blanket.

20 3. The multi-layer disposable medical thermal  
blanket of Claim 2 wherein said secondary fluid path  
comprises an inner secondary fluid supply path and an  
inner secondary fluid return path in fluid exchanging  
relationship relative to each other disposed inwardly  
25 relative to said outer primary fluid path about the  
periphery of said thermal blanket.

30 4. The multi-layer disposable medical thermal  
blanket of Claim 3 wherein said outer primary fluid  
supply path and said outer fluid return path extends  
substantially the length of said thermal blanket on said  
inner secondary fluid supply path and said secondary  
inner fluid return path extend to the mid-portion of  
said thermal blanket.

35 5. The multi-layer disposable medical thermal  
blanket of Claim 3 wherein the cross-sectional area of  
said primary fluid path is substantially greater than

the cross-sectional area of the secondary fluid path and said thermal application channels permit said primary fluid path to expand outwardly from the surface of said thermal blanket under the fluid pressure as fluid is circulated through said thermal blanket to effectively form a seal with the patient's body at the selected area of application to retain the thermal energy to the applied area.

6. The multi-layer disposable medical thermal  
10 blanket of Claim 4 wherein said outer primary fluid path includes an interrupted rib having a supplemental fluid path channel formed therein in fluid communication with said secondary fluid path and a plurality of primary fluid path channels formed on the outer portion thereof  
15 for fluid communication with the outer portion of said thermal application channels.

7. The multi-layer disposable medical thermal blanket of Claim 6 wherein said inner secondary fluid path includes an interrupted rib wherein adjacent segments of said interrupted rib cooperatively form secondary fluid path channels in fluid communication with the inner portion of said thermal application channels.

8. The multi-layer disposable medical thermal  
25 blanket of Claim 7 wherein said thermal application channels comprise a spaced apart plurality of thermal application ribs cooperatively forming said thermal application channels.

9. The multi-layer disposable medical thermal  
30 blanket of Claim 8 whereby said thermal application ribs comprise interrupted ribs forming a plurality of cross channels to permit fluid flow between adjacent thermal application channels.

10. The multi-layer disposable medical thermal  
35 blanket of Claim 9 wherein the outer portion of said thermal application ribs are disposed inwardly from said

interrupted rib of said inner secondary fluid path and said interrupted rib of said outer primary fluid path to permit fluid flow between the outer portion of adjacent thermal application channels.

5        11. The multi-layer disposable medical thermal blanket of Claim 6 wherein stop members extend inwardly from the mid-portion of said interrupted rib of said outer primary fluid path into the out end of said inner secondary fluid path to limit the flow of fluid between 10 said inner secondary fluid path and said outer portion of said thermal blanket.

15        12. The multi-layer disposable medical thermal blanket for controlling body temperature by either heating or cooling selected areas of application comprising an inner bladder for circulating fluid therethrough having a flexible sheet of foam formed by a plurality of discontinuous voids attached to one surface thereof to reduce the formation of moisture on the surface of said inner bladder adjacent said flexible 20 sheet.

25        13. The multi-layer disposable medical thermal blanket of Claim 12 further including a highly absorbent fabric layer attached to one surface thereof to improve thermal conduction between said inner bladder and the selected area of application.